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HAS THE ORACLE SPOKEN?

OUR first general impressions of the Report of the Heyworth Committee of Enquiry into the Gas Industry, set up by Major Lloyd George when Minister of Fuel and Power, were given in our issue of Dec. 12, on which occasion we threatened to return to the subject at a later date. A considerable quantity of water has flowed under the Thames Bridges since our first leader, and a certain amount of comment, much of it *sotto voce*, has taken place regarding what has been argued as the jumpy conclusions of this most important and, to our mind, not unpalatable report. In our opinion, the freedom from fulsomeness in the report is refreshing, and its direction is there for all to see.

It will be admitted, we think, that in the report the structure of the Gas Industry as it exists to-day is reasonably and adequately delineated. For example, can it be said that municipal areas are always appropriate regions for gas supply? Municipal boundaries, at any rate within the greater conurbations, appear to many thinking citizens to be drawn upon the most arbitrary lines, and the question why householders on one side of the street should have to pay more or less for gas than their neighbours on the other is not at the present juncture fatuous.

And is there real justification for the survival of small gas-making units serving districts within easy transmission range of one or more large central units? Maybe the present Minister of Fuel and Power, Mr. Shinwell, is not attracted by the 10 regions proposed in the Report, but on this aspect of the question we are speaking without the book. The Report does not discuss alternatives, though regarding these there have been suggestions, including the notion that the Industry might well be centrally ruled by Gas Commissioners whose work would include the carrying out of such amalgamations and combinations as appeared to them desirable and profitable from time to time. Another question which immediately springs to mind is the absence in the Committee's Report of reference to the setting up of machinery for the technical control of the Gas Industry as a whole. The control of the Minister of Fuel and Power appears to be limited to a veto on the recommendations of the Gas Personnel Advisory Panel for the manning of the Regional Boards, who appear to have almost independent powers. Nor is it irrelevant to mention that the Heyworth proposals involve the appointment of no fewer than 40 first-class men, most of whom obviously must be withdrawn from the higher branches of the Industry's personnel. It may be asked if the appointment of three, or shall we say five, Commissioners with ample ability and power would not be, in the event, a more practicable proposition.

Argument continues concerning the technical proposals, which again are unambiguous and to our mind appear reasonable. We doubt very much indeed whether working to a calorific value within the range of 450 to 500 B.Th.U. would deprive the Industry of any of the freedom which it may theoretically at the moment enjoy. Why, for example, should Birmingham declare 450 B.Th.U. per cu.ft., and Solihull, a comparatively few yards away, declare 480? And is there a conclusive technical reason why Lanarkshire should declare 400?

Finally, we would refer to a further most important recommendation in the Heyworth Report—that the sulphur content in town gas supply throughout the entire country should be reduced to 10 grains per cu.ft. Before the war and during the war there has been an enormous amount of discussion on this particular point, and from time to time recommendations have been made which, with a facility gained by years of experience, have been pleasantly shelved. Wartime experience of those undertakings which have seen fit to reduce the sulphur in their gas to 10 grains and less has shown that they have been amply repaid. And in view of official reports of the Institution of Gas Engineers issued years ago, it does seem that the Heyworth Committee's suggestion of a limitation to 10 grains per 100 cu.ft. is, to say the least, a very mild one.

FEARS AND SPECULATIONS

TURNING now to matters other than technical there are, of course, certain aspects of the Report which are exercising gas administrators and technical executives throughout the Industry. Concerning nationalization, the considered plan of the Industry, so we have been told—and it finds support, of course, in the Report of the Heyworth Committee—is that there will be no attempt to question this particular line of policy, that the Industry accepts the situation in a general sense, and that it will be willing to co-operate to the best of its power. At present we are going through a period of waiting and tension. Within the Industry itself there must be discussion and decision between privately owned and municipally owned gas undertakings, and transcending all this is the fact that to date the Government has given no inkling whatever of what it intends or does not intend to do with the Heyworth Report. In this period of waiting and tension, however, there should be positive action in the way of taking steps to maintain the goodwill and increase the efficiency of the Gas Industry. The Committee's Report, in fact, should not stand as a barrier to the adoption of schemes of extension, and in saying this we realize fully that while some undertakings are able to the moment to provide funds for development, others need further capital. Are the latter undertakings assured that they will be permitted to obtain capital if possible in the open market? Again, it is obvious that further information will be required if plants are to be built up and executed on the basis of regionalization. We understand that the British Gas Council is unanimous on the question of principle in this regard, but has expressed no views as to the suitability of any particular regions. It would seem that machinery is needed to deal with this question.

There is, too, in the minds of many technical men within the Industry uncertainty as to how their individual prospects will be affected under any such scheme as envisaged by the Heyworth Committee. Concerning this aspect we would emphasize that the Committee looks to a 20% increase in the Gas Industry's strength of service within a limited period. The accomplishment of this, of course, will depend upon the availability of labour and raw materials generally, and certainly the labour situation in the Gas Industry at the moment is not altogether pleasant to contemplate. Fundamentally, however, technical men will be needed more in the future than they have been in the past, and it strikes us that opportunity in many respects will be greater rather than less—that, in brief, there is really no foundation for gas engineers to walk in the shadow of fear.

Personal

Retirement of Mr. W. J. Smith, M.B.E.

After 30 years of faithful service to the central organizations of the Gas Industry, Mr. W. J. SMITH is resigning from Gas Industry House on his doctor's advice, and taking with him the best wishes of a host of friends for many years of happy and healthful retirement in which to enjoy those fine arts which have afforded so picturesque a background to his devoted labours. For several years he was in the secretarial department of the Gas Light and Coke Company, and in 1916 he was seconded for work connected with the formation of the National Gas Council. During the formation of the Council he personally visited undertakings in many parts of the United Kingdom. In 1919 he was appointed Secretary of the National Gas Council and of the Federation of Gas Employers, and Joint Secretary of the National Joint Industrial Council. His retirement from the two latter offices was announced last July, when he was succeeded by Mr. C. M. Plowman. Mr. Smith was closely identified with the formation of the British Road Tar Association and the British Tar Confederation, and was Acting Secretary of the latter from its inception until the appointment of a Secretary in August, 1945.

He was also Joint Secretary of the British Gas Federation, and when the National Gas Council and the British Commercial Gas Association became united last year he undertook the duties of Acting Secretary. He was Secretary of the Gas Advisory Committee to the Ministry of Fuel and Power, and of the Benzole Committee of the National Gas Council. In addition he was Secretary of the London Regional Gas Centre from 1940 to May, 1944. He had a unique knowledge of the personnel of the Gas Industry, and carried out his duties as Secretary in a manner which endeared him to all with whom he came into contact. Few men could have had a more complete grasp of the inner working of the national organizations, but he used his "Private and Confidential" rubber stamp with discretion in dealing with the gas Press. He was elected a Fellow of the Chartered Institute of Secretaries, and in June, 1944, the honour of Member of the Order of the British Empire was conferred upon him by the King.

During the war he was an active member of the Home Guard, and throughout the blitz regularly carried out fire-watching duties at Gas Industry House. He is a man of wide interests, and has an extensive knowledge of natural history and of the history of painting and music. He is himself a considerable artist, and a singer of some distinction.

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Mr. C. B. JONES, Senior Technical Assistant to the Neath Gas Department, has been appointed Assistant Engineer and Manager to the Halesowen (Worcs.) Gas Company.

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Lieut.-Commander F. K. EARL, R.N.R., formerly South-Western area representative for the Horstmann Gear Co., Ltd., has returned to the service of the Company after six years—mostly abroad—with the Sea Transport Service.

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Miss ESTA ELDOD, M.B.E., has been appointed Public Relations Officer to Radiation, Ltd. She has rejoined the Company after 5½ years' war-service as Chief Press Officer for the Women's Royal Naval Service.

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Lt.-Col. T. C. WHIMSTER has now been demobilized and will represent the Parkinson Stove Co., Ltd., in the Eastern Counties. Before enlisting he represented the Company in the North of England area.

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Mr. J. L. ANSTEY, who has just been released from his duties as Sq./Ldr., R.A.F., has been appointed Midlands Representative of the Parkinson Stove Co., Ltd. Prior to the war Mr. Anstey was with the Coventry Gas Department.

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Dr. GANO DUNN (U.S.A.) has been elected a Vice-Chairman of the International Executive Council of the World Power Conference. He has been President of the J. G. White Engineering Corporation since 1913, is a Past President of the American Institute of Electrical Engineers, and has been Chairman of the Visiting Committee, Bureau of Standards, since 1928. Dr. Dunn was an official delegate and member of the Executive Committee at the Third World Power Conference at Washington in 1936, and has been Chairman of the American National Committee of the Conference since June, 1945.

At a staff dinner given by Drakes, Ltd., Halifax, Mr. JAMES SCHOFIELD, F.L.A.A., Secretary, who had completed 50 consecutive years' service, was presented with a solid silver tea service and tray by Mr. J. A. Drake, Chairman of the Company, in appreciation of his excellent record. Mr. Schofield has served the last 15 years in the capacity of Secretary, after acting as Assistant Secretary for 18 years. On behalf of the Staff, Mr. H. Greenwood, Senior Representative, also presented Mr. Schofield with a gold watch. Mr. Schofield, in acknowledging the gifts, referred to the fact that he had had the pleasure of knowing the founder of the firm, Mr. Jonas Drake.

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The further list of New Year Honours published on Jan. 9 included the announcement of the award of the O.B.E. to Mr. W. L. BOON, General Manager of the London and Counties Coke Association; Professor W. M. CUMMING, Senior Gas Adviser, Scottish Civil Defence Region; Mr. A. T. GREEN, Director of the British Refractories Research Association; and Mr. G. C. PEARSON, Engineer-in-Chief of the Birmingham Gas Department and Vice-President of the Institution of Gas Engineers. The M.B.E. has been awarded to Mr. C. F. BARROW, lately Distribution Superintendent, Sunderland Gas Company; Mr. J. CAMPBELL, Regional Gas Officer for Scotland; Captain L. G. GEORGESON, Master of S.S. "Wimbledon" (Wandsworth and District Gas Company); Mr. J. T. GRAY, Chief Engineer Officer, S.S. "Camberwell" (South Metropolitan Gas Company); Mr. R. W. GREEN, Chief Engineer, Aldridge & Ranken, Ltd.; and Mr. G. W. P. MARTIN, Chief Assistant, Ministry of Fuel and Power. A long list of recipients of the British Empire Medal includes A. BELL, Mains Foreman, Bradford Gas Department; C. MITCHELL, Boiler Stoker, East Hull Gas Company; G. W. REID, Tool Room Foreman, R. & A. Main, Ltd.; and L. R. SINCLAIR, Boatswain, S.S. "Camberwell" (South Metropolitan Gas Company).

Letter to the Editor

Oxide Purification

DEAR SIR,—In your Editorial of Jan. 2, dealing with the Paper given by G. U. Hopton and Dr. R. H. Griffith, due credit is given to the excellent work of the Authors. It is not my desire to discuss the results given in the Paper, but from the final paragraph in your article one might assume that oxide is merely an agent for the removal of sulphur from the crude gas. This, I think, does not do justice to the oxide process. Oxide is not merely a sulphur eliminator; it also eliminates all those other impurities which pass the purification plants earlier in the usual gas-works practice. The oxide in the boxes takes out not only the sulphur but also the tar fog, a large proportion of the gum-forming bodies, any excess of ammonia, and the cyanogen bodies, all of which are undesirable constituents of the pure gas passing forward into the distributing system. At the same time, any possibly objectionable effluent is avoided. The oxide does all this with very little scientific control, so diminishing the load on the shoulders of a busy chief. These are added merits in the use of oxide for purification purposes, and they ought not to be overlooked when other systems of purification are considered.

Manox House,
Miles Platting,
Manchester, 10.

Yours faithfully,
R. H. CLAYTON.

Diary

Jan. 17.—Fuel Luncheon Club: "Operation P.L.U.T.O.," A. C. Hartley, Chief Engineer, Anglo-Iranian Oil Co., Connaught Rooms, 12.40 for 1.10 p.m.

Jan. 17.—Solid Smokeless Fuels Federation: Executive Committee, Grosvenor House, 11.30 a.m.

Jan. 21.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.

Jan. 26.—Manchester and District Junior Gas Association: Paper, "The Application of Laboratory Tests to Works Control," C. Whitehead (Preston), 3 p.m.; Annual Dinner and Social Evening, 5 p.m., Engineers' Club, Manchester.

Jan. 26.—Midland Junior Gas Association: Visit to Incandescent Heat Co., Ltd., Smethwick.

Jan. 29.—Southern Association of Gas Engineers and Managers (Eastern District): Paper, "Gas Charges, with Special Reference to Tariffs," A. Tennant (East Surrey Gas Company), Gas Industry House, 2.30 p.m.

Feb. 12.—British Gas Council: Gas Industry House, 2.15 p.m.

British Gas Council

A Meeting of the British Gas Council was held at Gas Industry House on Jan. 9. Mr. A. E. Sylvester, F.C.A., Chairman of the Council, presided, and there were 59 members present. A welcome was extended to Councillor Edward S. Douglas, Convener of the Dundee Gas Department, who was attending for the first time.

The following alterations in membership were reported:—Resignations: Mr. W. Grogono (Croydon), Mr. R. Robertson (Bristol), and Mr. A. E. Ruffhead (Darlington).

Additions: Lieut.-Colonel John Kennington (Gt. Grimsby) in place of Mr. F. H. Robinson (retired), and Mr. J. E. Wakeford (Coventry) in place of Councillor H. Weston.

A report was received from the Executive Board, the following being among the matters dealt with: The resignation, consequent upon medical advice, of Mr. W. J. Smith, M.B.E., F.C.I.S., as Acting Secretary was received with regret, and it was resolved that a letter be sent to Mr. Smith in the following terms:

> "The British Gas Council at its meeting to-day accepted with regret your resignation consequent upon the advice of your doctor that you should retire from active work. The members recalled with gratification your long and outstanding work as Secretary of the National Gas Council and of other bodies connected with the Gas Industry. Appreciation was expressed of the help which you so readily gave to members who personally sought your assistance. The Council, on behalf of all those who serve the Gas Industry, asks you to accept its gratitude for the part you have played, with so much devotion and ability, in the activities of the Industry in general and of its national organizations in particular. The members hope that you will for long enjoy and have good health during your well-earned retirement, and would like you to convey their good wishes to Mrs. Smith and your family."

It was agreed that the members of the Council and others desiring to do so should make a presentation to Mr. Smith, contributions to which, not exceeding one guinea each, should be sent to the General Manager, Mr. J. R. W. Alexander.

Pending the appointment of a Secretary it was agreed that Mr. Leslie F. Stemp, B.A., LL.B., Barrister-at-Law, should be Acting Secretary.

It was reported that representatives of the Council had met the Minister of Fuel and Power on Dec. 18, 1945, to discuss matters arising from the Government's intention to nationalize the Gas Industry, with particular reference to the maintenance of the development of the Industry during the interim period, and that a Report on the meeting had been sent to the representatives of all gas undertakings.

After discussion it was resolved that, to afford adequate information, a brief memorandum should be sent to representatives outlining the events leading up to the present position, and stating the policy of the Council, which had not been clearly represented in the attenuated reports which had appeared in the national Press.

Colonel H. C. Smith was nominated a Vice-President of the British Road Tar Association.

Mr. A. E. Sylvester was nominated a Vice-President of the Conjoint Conference of Public Utility Associations, and was reappointed "leader" of the gas representatives on the British Tar Confederation.

The Council approved that financial assistance be given towards the cost of any approved Petition on behalf of gas undertakings against Bills promoted by the City Councils of Lancashire, Cheshire and Nottinghamshire, in so far as they affected the Industry generally.

It was agreed that, subject to review in the light of circumstances, newspaper advertising should be resumed on July 1.

The War Damage Committee reported that it had again considered the method of apportioning the amount of War Damage Contribution to be levied on all undertakers in the Industry. The Committee saw no reason to depart from the former decision that such contribution should be allocated among individual undertakers on the basis of the number of therms sold, excluding sales in bulk to other undertakers.

Future meetings of the Council are to be held on the afternoon of the second Tuesday of the month. The next meeting will, therefore, take place on Feb. 12 at 2.15 p.m.

Coventry City Council has decided to extend and improve the gas supply in the Urban District of Bedworth, which the undertaking took over some years ago. The output in that area has already increased more than fourfold, and some 700 additional houses are planned for erection within the next few years. The cost of the scheme is estimated to be £6,000.

The Visco Engineering Co., Ltd., has issued a new catalogue giving a brief description of various types of air filters, and which describes fully its standard static air filters and their applications. The Company has also issued a leaflet giving details and illustrations of its Patent "Sprayblast" oil cooler, which was the first to use a mixture of air and water as the cooling medium, and which was designed to overcome the difficulties found with either air or water operation. The "Sprayblast" incorporates the advantages of both without any of their disadvantages.

Codes of Practice

Two further chapters of the Code of Functional Requirements of Buildings have now been published for the Codes of Practice Committee by the British Standards Institution. They are Chapter I (C), Ventilation, and Chapter VII (F), Provision of Artificial Light. A third chapter, Chapter I (B), Sunlight, is now in print. These chapters were originally issued in draft form some months ago. They have since been revised in the light of the criticisms and suggestions then received, and are now appearing in their final form. In view of the present housing emergency, all three documents are limited in scope to houses, flats and schools only. Chapters dealing with all types of buildings will be issued later.

Chapter I (C), Ventilation, lays down recommended standards of ventilation, both natural and mechanical. Chapter VII (F), Provision of Artificial Light, is divided into two parts: Part I, Houses and Flats, and Part II, Schools. It describes the functional requirements of a good lighting system, and the factors to be considered in the choice of fitting and the size of source. It also includes tables giving the recommended illumination values for particular purposes. Chapter I (B), Sunlight, gives general recommendations as to siting, orientation and design, with a view to obtaining the maximum amount of sunlight in buildings throughout the year. Copies may be obtained from the British Standards Institution, 28, Victoria Street, S.W. 1, price 6d. and 2s. post free respectively.

The Industrial Ten

The Board of Trade, on the advice of the British Employers' Confederation and the Trades Union Congress, has decided to issue for the current rationing period ten additional clothing coupons to a wide range of manual workers in industry and agriculture. This extra ration, usually known as "The Industrial Ten," is similar to that given in the 1944/45 ration period, and the categories of workers eligible, including many workers in the Gas Industry, are substantially the same. Part-time workers in eligible occupations will be able to apply if they work 22 hours or more a week, and supervisory workers if they are exposed to exceptionally hazardous conditions. Arrangements have again been made to issue the coupons to workers entering employment for the first time in the course of the rationing period.

These coupons will be issued as before through local offices of the Ministry of Labour and National Service to employers, for distribution to their workers. The coupons will be available to employers and Trade Union branches until Mar. 2, together with the necessary forms of application and the leaflet (reference TC/46) entitled "The Industrial Ten," which gives full details of the workers eligible for coupons and the method of application. Special arrangements are being made for certain industries in which there are some workers with exceptionally heavy needs. Details of these are being notified to the employers and workers concerned through the Employers' organizations and Trade Unions.

Sheffield and District Gas Company officials attended their annual dinner at the Royal Victoria Station Hotel, Sheffield, on Dec. 20. The photograph shows Mr. Ralph Halkett, General Manager and Chief Engineer, with some of the officials of the Company, including Mr. A. W. Field, Secretary, Mr. C. Plumtree, Chief Accountant, Mr. W. R. Oliver, Public Relations Officer, Mr. W. Woodcock, Transport and Mechanical Superintendent, Mr. W. Braithwaite, Personal Assistant to the General Manager, and Mr. L. Harrison, District Manager of Barnsley Gas Works. This was their first post-war dinner, and also their first under the new General Managership of Mr. Ralph Halkett. Mr. Ralph Halkett, sen., who was ill, was unable to attend for the first time since the inception of the dinner.

Benhams at War

Benhams at War is the title of a book which is being published privately, mainly for the benefit of the employees of Benham & Sons, Ltd., whose normal business is the manufacture of cooking apparatus generally and dish-washing machines, besides which they are heating and ventilating engineers in a large way.

Prior to Mr. Chamberlain's flight to Munich in 1939, the firm had constructed many large factory and holiday camp kitchen installations which were automatically turned over for national work later; and by the time it was obvious that war was inevitable, large Army camp kitchens and others for feeding factory workers were well under way. It was a special tribute to the late Mr. Stanley J. Benham that in 1940 he was made responsible for the design and equipment of the canteen kitchens for all Royal Ordnance Factories and their hostels; for it became urgent that amenable conditions should be given to the huge numbers of workers who had been moved from their homes to be nearer their work. So hectic did conditions become that on one occasion the Company was given 14 days only to equip 17 new dining-rooms. Then in 1940, the Statutory Rule and Order of the Factory Act was passed, which made canteens obligatory to war factories employing over 250 persons; this also involved an enormous amount of work. While many firms' names could be mentioned, it is worth recording that 24 canteen kitchens were fitted up for Vickers-Armstrong's alone, as well as several installations for American aircraft assembly plants. Again, in the autumn of 1940, the first Ministry of Food British Restaurant was opened up during the blitz.

In the early days of the war the firm was under contract with the Air Ministry for fitting up R.A.F. Station kitchens, of which no less than 131 installations, including some American, were completed; many Admiralty Militia camp installations, too, were fitted up as well as numerous depots ancillary to the three Services. The firm was also responsible for the Army School of Cookery kitchen installation at Aldershot. Later on much of the new equipment was pooled, which resulted in installations having cooking appliances of different manufacturers; Benham cooking apparatus was equally used, but more widely dispersed in Government canteens of all kinds. Sometimes also the firm carried out installation only, or ventilation plant, while the heating side of the business installed many, and some very large, heating installations involving central boiler house plants serving whole camps and establishments—at the R.N. Propellant Factory at Caerwent the work took four years. During the war Benham cooking apparatus was to be seen in Iceland, Ireland, the Orkneys and the Hebrides, Malta, Gibraltar, Egypt, Singapore, Australia, New Zealand, South Africa, Iran, Iraq, and Turkey.

During the period 1939/1944 the following general items were made by the firm: 1,060 heavy pattern coal-fired ranges, many of which had four furnaces and six ovens; 600 heavy pattern gas ranges, mostly consisting of fittings with multiple units; 8,000 hot closets, 1,120 Hercules and 1,290 Rotex dish-washing machines, 860 boiling pans, 150 pastry ovens, 300 roasting ovens, and 1,325 steaming ovens. Many of the latter fittings comprised units with several compartments.

Compared with the First Great War, when the firm was also engaged on munition making, the second "effort" was far greater, for by then their works had greatly increased in size and consequently there was greater capacity, but technically the work undertaken was more of a precision nature. On Empire Day, 1940, Benhams' first munition order was received for Holdfasts for defence guns, and on May 24, when German invasion was expected hourly, the first order, which was for 70, was received with details. The Holdfasts were made and despatched by passenger train within 8 days and 6 hours. Altogether over 1,000 Holdfasts were made by the firm. From the Ministry of Supply instructions were received for 3-in. single U.P. projectors; some 1,600 of these were made, at first under extreme secrecy. Then came 29 mm. spigot mortars, known as the Blacker Bombard, of which the firm contracted to make 2,000 with leg mountings and reinforcing cradles for concrete mountings. Perhaps the most complex job undertaken was for 6-pounder anti-tank gun carriages, and for these were produced 2,885 saddles, 2,100 brackets (supporting saddles), 2,000 sets of firing gear and 2,590 trail wheel assemblies. Photographs, drawings and notes were submitted for Ordnance Factories in India, Canada, and Australia which were about to start production. A contract was also received for 20 mm. Universal mountings, which involved making a large number of jigs and tools.

Of the many who sub-contracted for the firm, as a notable example were the services of three professors and the instructional staff of the City and Guilds College, South Kensington, with a member of the Benham staff as works manager; others, too, who had workshop lathes helped, amongst whom was Mr. L. G. Walkden, Chief Engineer of the Royal Institute of British Architects, who assisted in turning gun mounting trailing wheel handles. The main works of the firm are at Wandsworth, and to cope with the "effort" a number of subsidiary premises were taken over at St. John's Hill, Clapham Junction; South London Garages, Wandsworth Common; a baby carriage works; a works at Colliers Wood, and others at Holloway and Tufnell Park. Mr. J. E. Benham was awarded the M.B.E., Mr. W. L. Clarke having already received a similar honour for services rendered in the First Great War.

Gas Undertakings' Results

Bilston Gas Light and Coke Company.—The Directors' report for the year ended September 30 shows that the sales of gas exceeded all previous records, and although the costs of coal, wages, and materials increased during the year, no increase was made in the prices charged to consumers. The total amount of gas sold was 655,766,100 cu.ft., which yielded £112,237. The balance of revenue after meeting all charges for depreciation, provision for war damage contribution and taxation, was £5,049, and after payment of final dividends the amount carried forward was £10,040, compared with £8,952 brought in.

Bradford Gas Department.—Total sales of gas for the year ended March 31, 1945, according to the annual report just issued, were 2,412,232,000 cu.ft., as compared with 2,205,424,000 cu.ft. for 1944, an increase of 206,808,000 cu.ft., or 9.37%. For 1935 gas sales totalled 1,880,418,000 cu.ft., and in 1939 the total was 1,897,771,000 cu.ft. The maximum daily consumption was 11,747,000 cu.ft. on January 24, and the maximum weekly consumption was 71,209,000 cu.ft. for the week ended January 29. In the face of all the difficulties prevailing at the end of 5½ years of war, Mr. G. E. Currier, Engineer and Manager, states that it is highly gratifying to be able to record a net surplus profit of £49,124 for the financial year. The Department continued to supply gas of the standard quality and pressure throughout the whole of the war period with the exception of a small portion of the Central Area, which was temporarily without gas for one or two days as a result of enemy action in August, 1941.

Oldbury Gas Department.—The annual accounts of the Oldbury Corporation Gas Undertaking show a net profit of £8,540 on the year's working, as compared with a net loss of £7,450 the previous year.

West Bromwich Gas Department.—A net loss of £3,987, as compared with a net profit of £9,143, is recorded in the annual accounts of the West Bromwich Gas Department. The total income for the year ended Mar. 31, 1945, was £213,194, compared with £215,559 for the previous year. The quantity of gas sold during the quarter ended Sept. 30 was 182,620,841 cu.ft., being an increase of 711,763 cu.ft. over the corresponding period the previous year.

By weekly contributions employees of the Newcastle-upon-Tyne and Gateshead Gas Company have raised £1,542 for their medical charities fund for the past year.

Following a report by the Gas Engineer and Manager, Mr. J. E. Wakeford, the Coventry City Council has decided to reduce the price of gas to all non-domestic consumers by 2.3d. per therm as from April 1.

Application has been made by a committee of the Coventry City Council to the appropriate Committee for the return to the gas undertaking of the central showrooms, which have, for the last few years, been utilized in the main as a British Restaurant.

Three employees of the Wolverhampton Gas Company, whose service with the company totals 159 years, retired on Dec. 31. They were Mr. John Hill, Collector of Accounts, 59 years; Mr. A. G. Lamb, Chief Meter Tester, 51 years; and Mr. P. F. Coombe, showroom attendant, 49 years. Mr. Hill, who is in remarkably good health after his long service, has served under eight chairmen of the Company.

An American firm, L. Pontikos & Co., of Cleveland and Cincinnati, who specialize in industrial painting, have successfully carried out an interesting experiment using gas for flame cleaning and dehydration of steelwork. This method was employed when the 840 ft. Grandin Road Viaduct was repainted, and proved most successful. Using 1,000 B.Th.U. gas distributed in the city and air for combustion, the lightweight torches utilize gas at 4 oz. pressure and compressed air at 60 lb. Each torch uses 125 cu.ft. of gas per hour. Total gas consumption for the entire undertaking was 85,000 cu.ft. This is a remarkable example of gas utilization under difficult conditions.

During the War, acting for and on behalf of the Ministry of Aircraft Production, George Wilson Gas Meters, Ltd., managed a dispersal factory at Rushden, Northants. On Jan. 2 a dinner and social evening was held at Rushden on the occasion of the factory being given up. The Chairman and Managing Director of the Company, Mr. W. D. Wilson, was accompanied by his fellow Directors, Mr. F. C. Wilson, Mr. G. E. Withers and Mr. W. A. Dobson, together with Mr. M. Farmer. Mr. D. C. E. Poole was unable to be present, having only recently come out of hospital following an operation. The evening was a very happy one, and presentations were made to Mr. G. W. Toman, who has been managing the Rushden concern, and to Mr. R. Usher, who has acted as foreman for the whole period of the war. Mr. Toman thanked the employees for their co-operation, and for the personal gift of a smoker's cabinet to himself. Mr. Usher expressed thanks for gold cuff-links with which he was presented. Mr. W. D. Wilson also congratulated the employees on a magnificent war effort, which had provided a substantial contribution to the aircraft programme. He concluded by wishing the employees every good fortune for the future, and expressed appreciation to the townspeople, who had provided a welcome to the firm.

Fuel Utilization*

By G. E. FOXWELL, D.Sc., F.Inst.P., F.Inst.F.

[Specially abstracted for the "GAS JOURNAL"]

IN this Paper the Author presents the findings of a non-party committee set up by the Liberal Party early in 1945 and before the decision was taken to hold a General Election.

Our financial position after the war can only be put on a sound basis by making the best possible use of all our indigenous resources, of which coal is the chief. Policy must be directed to the conservation of coal until other sources of heat and power as yet undiscovered become available, and to its utilization so that it makes its maximum contribution to the welfare of the country and to the rehabilitation of British industry.

The proper utilization of coal cannot be left entirely to producers and users. It must be kept under constant scientific observation, and some supervision both of production and utilization must be maintained by the Government.

Mr. Forster Brown (Pres. Address, Inst. Mining Engineers, 1940) estimated the average life of all collieries, on the basis of the total tonnage probably available, at 75 years, and 45 years on the basis of seams being worked at the time of examination. The corresponding figure for Germany was 185 years, and that for the U.S.A. much greater. We shall thus be driven to using the deeper, thinner and more expensive coals a century before Germany, and several centuries before the U.S.A. The pit-head price of coal in the U.S.A. is 10s. a ton less than in this country. Miners in the U.S.A. are paid much higher wages, but coal is produced from shallower levels and by more modern methods which we cannot necessarily copy.

Eve of a Crisis

Great Britain is therefore at the beginning of a serious crisis in the coal-mining industry which can, to some extent only, be met by the recommendations of the Reid Committee. It is recognized that the export of coal is necessary in certain circumstances, but the export of raw coal should only be allowed under Government licence, and such licences should be given with reluctance. Over the past quarter century we have exported one out of every five tons of coal mined. By exporting raw coal we export an irreplaceable asset upon which little labour has been expended, helping to conserve foreign coal at the expense of our own. Raw coal should be retained in this country, and finished products upon which much labour has been expended should be exported. It should be possible to save, by export restrictions, 30 out of the 40 million tons annually exported.

The case for the abolition of smoke is set out in full. The Committee was of the opinion that complete abolition and not reduction of the emission of smoke should be aimed at, the domestic fire being the chief offender. This involves using smokeless fuels for domestic and many other purposes to the exclusion of raw bituminous coal. The great bulk of such fuel must be derived from the carbonization of coal in gas-works and coke ovens, by the Gas Industry, the by-product coke oven industry, and a comparatively small low temperature carbonizing industry. From the point of view of solid fuel there is no special virtue in the temperature of carbonization.

Carbonization is the only known method of producing smokeless fuels from bituminous coal. Particularly for domestic purposes 25 million tons of coal might eventually be saved annually if all the coal thus used were first carbonized and the gas and coke used in modern appliances. Surveys of the amounts of smokeless fuel available and of the resources of the constructors of carbonizing plant suggest that if the Government announced a definite policy of smoke abolition its accomplishment within five years would be feasible, given the labour and materials.

The organization and co-ordination of the Carbonizing Industries under a Central Carbonization Board is advocated. The proposition is that a Central Carbonization Board should be set up on the lines of the Central Electricity Board operating in a similar manner, charged with the complete co-ordination of the carbonizing industries, with securing the efficient use of coal and the allocation of the coking coals of the country to the uses for which they are best suited, with the best siting of new plant, with the long distance distribution of gas by grid pipe lines, and the regulation of the supply of coke and gas to the various markets with control of prices.

Equipment of New Houses

The Government should insist that the new houses should be equipped with appliances capable of the efficient use of solid smokeless fuel, and that they should be effectively insulated. No permanent building intended for habitation should be passed by local authorities or rank for any sort of subsidy unless it is satisfactorily constructed with thermal insulation.

If the use of smokeless fuels became general for domestic purposes, a further quantity of coal would be carbonized to replace the 40 million tons used in the raw state in the domestic grate. Used in modern appliances and in houses properly insulated considerably less than this additional quantity of coal would be needed for carbonization. Bearing in mind also the normal increase in the industrial use of coke and gas and the contribution of smokeless coals, it is reasonable to suppose that a total of some 60 million tons would require ultimately to be carbonized per year.

Steps should be taken to encourage the inception and development of a chemical industry based on this greatly increased quantity of carbonized coal. In the U.S.A. a chemical industry, which has no parallel here, is springing up based on petroleum, while the Germans have developed the Fischer-Tropsch process, the unsaturated gases and oils from which present considerable possibilities for the production of chemicals, particularly those needed by the plastics industry. We have clearly lagged behind other nations in research on chemicals derived from coal. A Fischer-Tropsch plant should be erected in this country for intensive study on the same lines as the coal hydrogenation plant erected by I.C.I., Ltd.

Other points dealt with are the home refining of petroleum (for which Government encouragement is again invoked), the use of electricity generally (from the technological point of view the developments during the past 30 years—*e.g.*, for heating purposes, have not always been wise), railway electrification (by which, the Weir Report is quoted, it is estimated that 10 million tons of coal might be saved annually), hydro-electric power ("the Severn Barrage Scheme should therefore be started at once. . . . Consideration should also be given to the practicability of obtaining hydro-electric power from Switzerland or Scandinavia"), and the co-ordination of the Gas Electrical Industries—again directed by the Government.

On the subject of District Heating the Committee were of the opinion that on no account should a separate public utility be set up for this development, but that whatever is done should be under the direction, management and control of the co-ordinated gas and electrical industries.

The use of raw coal will continue for many industrial purposes, but low volatile coals (and coke) should generally be used. Expert technical services to ensure the effective use of coal in small industries should be maintained, co-ordinated and guided by the Minister of Fuel and Power. Much of the work of the Fuel Efficiency Committees during the war should be continued on a permanent basis. It is suggested that a long-term policy might produce an annual saving of 40% of the coal used for industrial purposes, or approximately 20 million tons anuually.

Price Structure

The importance of a stable price structure is emphasized. Manufacturers cannot design and make appliances capable of dealing efficiently with the various classes of fuel unless they are assured of a stable demand. Arrangements made some 13 years ago for the sale of gas coke are quoted as exemplary of good salesmanship. Fair prices were stabilized, and the technical development of new appliances and new uses for coke has steadily advanced. Stability of quality is equally necessary. Some overriding price control by Government is necessary to ensure that the consumer is not exploited.

Underground gasification is treated briefly, with the recommendation that we should make practical trials "in order that we may keep in the van of progress," and either devise a method suited to our requirements, or decide that it is not suitable to British conditions.

Electrification of mining equipment, the supply of electricity from industry to the grid, coal cleaning and the utilization of small coals, waste heat recovery in industry, research, and education are also referred to. Existing methods of distributing coal from pithead to consumer are severely criticized. The whole question requires expert and independent investigation. The erection of storage silos at railway depots, mechanical wagon discharge, machine loading to merchants' vehicles, and automatic weighing and bagging are suggested, and the possibility of transporting coal by water-carriage in a pipe line is mentioned.

Orders for more than 20,000 oxygen, acetylene and carbon dioxide cylinders have been received from European and South American countries since VJ-day by the Tube Investments Group of engineering industries, and the cylinders are now in production at their Chesterfield works. First deliveries have already been effected. These are new markets for British industry, having been previously held by Germany. The largest individual post-war contract of this type, for 12,000 oxygen and acetylene cylinders, comes from Holland, in connexion with that country's rehabilitation plans.

* Presented to a joint meeting of the Institute of Fuel (Scottish Section), and the National Smoke Abatement Society (Scottish Branch), at Glasgow.

MIDLAND JUNIORS

The "C.C." Burner*

By J. PALSER

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THE purpose of this Paper is to introduce a method of burning an air/gas mixture in a concentrated form, which has been applied to industrial heating processes. The burner has become known as the concentrated combustion burner or the "C.C." burner. It consists of an air-blast burner arrangement which depends, in principle, upon the combustion of the gas mixture in a refractory tunnel to give a high temperature, high velocity, and a unidirectional stream of products of combustion. I will deal with the development of the burner from a practical point of view, following on with some applications and results to date. There is still much development work to be done, but it is considered that this is an appropriate time to report on initial work.

Three years ago experiments were undertaken in the Industrial Heating Section of the Birmingham Gas Department. Such experimental work had to take second place to the more urgent task of war production. But with the co-operation of certain consumers and other gas undertakings, burners were installed for varying processes to ascertain their performances and life under workshop practice. Some time after our experiments with concentrated combustion had been started, by coincidence, American Gas Engineers introduced a series of high intensity burners described as "compacted combustion," one type being known as the radiant cup burner. From the description given in the Technical Press this burner is entirely different in design and effect to the "C.C." burner, which depends upon directional high velocity products of combustion and subsequent radiation from the walls of the working chamber, whereas the American type is designed primarily for radiation, the combustion products becoming secondary. A later series of burners has been introduced in the U.S.A., and while their design is not the same as the "C.C." burner, their effect should be similar.

For most of our experiments the simplest form of low-pressure gas and air blast injector was used, which mixed practically at the burner nozzle; the Americans use pre-mixed air and gas proportioned in special machines. We have one installation working satisfactorily on high-pressure gas (10 to 12 lb. per sq.in.), but the arrangement is not as flexible on "turn-down" as the air blast system—this is no doubt due to the type of injector used. We are prepared to test the premixed air and gas burners when the opportunity arises. However, we are apparently in agreement with the Americans on one point—*i.e.*, a multiplicity of small burners with separate feeds for the gas consumption required are preferable to a small number of large burners.

The "C.C." burner comes within the category of tunnel burners; therefore, the principle is not new. The name "tunnel burner" usually implies that a refractory block is attached to the burner, the outlet of which is continued into the block. This passage may be in the form of a parallel hole, cone-shaped or a combination of both. The purpose of the refractory block is to create a back pressure on the burner nozzle, which has the effect of stabilizing the flame to maintain ignition or to direct the flame to any desired angle. It is also used to prevent the burning away of the burner nozzle.

The two main differences between the tunnel burners already available and the "C.C." burner are:

(*a*) The proportions of the tunnel in the "C.C." burner are such that the combustion of the air/gas mixture is substantially complete therein.

(*b*) Small individual injectors with nozzle mixing are fitted to each tunnel, which almost eliminate the possibility of lighting back, as experienced with mixture manifolds on "turn-down."

The Development of the "C.C." Burner

The first experiment was made with a single combustion tube which was made of unglazed porcelain, 6 in. long, $\frac{3}{8}$ in. internal diameter, and having a wall thickness of approximately $\frac{1}{8}$ in. This was surrounded by a layer of high-temperature insulation brick, the whole being enclosed in a mild-steel casing. A simple form of low-pressure gas and air blast injector made from standard gas fittings was attached to one end of the combustion tube with a seal around the nozzle end to prevent the blow-back of hot gases which would otherwise have burnt away the nozzle, this being made of ordinary wrought iron $\frac{1}{4}$-in. gas pipe. By adjusting the gas and air controls to give approximately theoretical mixture, the free burning flame flashed back down the refractory tube to the burner nozzle, and a temperature of between 1,600° and 1,700°C. was reached in the tunnel within a few minutes of lighting up. From the end of the tube issued a stream of products of combustion at both a high temperature and a high velocity, which could be directed to any angle. The consumption of gas of 450 B.Th.U was 120 cu.ft. per hour at 3-in. water gauge with an air pressure of 10 lb. per sq.in. Manifolds with a number of burner nozzles and a single injector were used. This arrangement was ultimately dispensed with in favour of a separate injector for each nozzle and individual adjustment of air and gas supplies to each

It was realized that while the combination of the fragile porcelain tube and the high-temperature insulation brick suited our purpose of investigation, it would not be serviceable; the very rapid rise from atmospheric temperature to 1600°C. and above in a few minutes, and the reversal from that temperature, are rather gruelling tests for any refractory material. Many kinds of refractories were tried with varying results, the most satisfactory being a proprietary ramming mixture which was introduced to us by a consumer who was interested in the experiments. The introduction of this mixture brought about a different technique in the construction of the burner block. Metal or wooden moulds were made in suitable sizes and greased steel tube mandrels were placed vertically at the required centres, the mixture being hammered into the space between the mould and the mandrels. After filling, the mandrels were withdrawn, leaving holes which formed the burner tunnels. The blocks were left to air dry for 48 hours, then removed from the moulds and fired in a furnace to a temperature of approximately 1,400°C. The blocks, after being allowed to cool down slowly in the furnace, were then ready for assembling either into furnace brickwork settings or into fabricated mild-steel boxes which were to be used as part of the burner assembly.

A later method to be adopted was the use of actual burner boxes for the moulds. These were lined with firebrick or firetiles, and the mixture was rammed into position around the tube mandrels which were located on the burner nozzles. After the withdrawal of the mandrels the blocks were allowed to air dry and were then fired by their own burner arrangement. This procedure saved both time and the expense of making moulds.

It should be appreciated that work of an experimental nature usually takes shape in a very crude form, and at least as far as the Birmingham Gas Department is concerned, once the principle has been established, it is left to the industrial gas appliance manufacturers to produce the finished product. In this instance the Selas Gas and Engineering Company and the Thermic Equipment and Engineering Company, Ltd., were approached regarding manufacture.

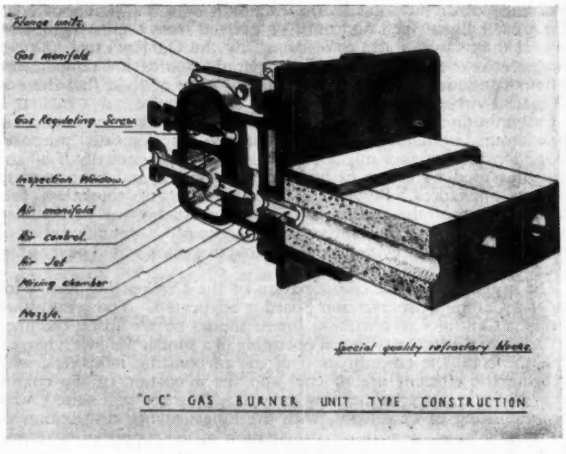

FIG. 1.

Burners from the Thermic Company are now available, and consist of patented burner assemblies of unit construction, which allow for any number of burners to be made from a single unit. The refractory portion of the burner is now being made in pre-fired special sillimanite material, the life of which has not yet been determined, as this is a new departure. Their standard burners are made with the centres of the tunnels at 2 in. or 3 in. apart in a single line. The gas and air connexions may be at the end or centre of the manifold, dependent upon the size of the burner. The gas and air passages to each tunnel are adjustable, and a further innovation is the window at the back

* From a Paper read at a meeting of the Midland Junior Gas Association.

of the air-adjusting screw, through which combustion conditions can be readily observed.

Characteristics of the "C.C." Burner

A particularly interesting feature of this burner is the fact that combustion of the approximate theoretical gas/air mixture is substantially complete within the burner tunnel, the effect of which gives the appearance of a burner in the "lit back" condition. This fact is borne out by a message received regarding burners which had been supplied for a certain process. It appeared that someone had attempted to adjust the burners to give the normal aerated free-burning flame without success and had reported that faulty burners had been delivered.

When the burner is correctly adjusted and burning in the open, only a short feather of flame is visible at the end of the tunnel. The effect of over-aeration, which reduces the flame temperature, causes the flame to disappear. When it is so desired, high thermal concentration can be used. Heat releases as high as 25 therms per cu.ft. have easily been obtained, resulting in the attainment of extremely high temperatures within a short space of time. For example, in one experiment on high-speed steel hardening, a small "D" shaped carborundum muffle was raised to a temperature of 1350°C. from cold in seven minutes.

Gas Consumption of Single Tunnel Burner (Thermic) with Different Air Pressures and Air Jet Diameters.

Gas pressure constant on main supply = 3½ in. w.g. throughout.

Air pressure, lb./sq. in. at burner.	Gas consumption cu.ft./hour with air jets.		
	$\frac{7}{32}$ in. dia.	¼ in. dia.	$\frac{5}{16}$ in. dia.
1½	110	136	181
1¼	100	126	172
1	89	111	148
¾	78	96	128
½	64	78	104
¼	46	55	74

These figures are for a standard single tunnel burner of "Thermic" design having the following dimensions:

Tunnel	6 in. long by 1 in. diameter.
Burner tube and nozzle	2½ in. long by $\frac{7}{16}$ in. internal diameter.

A stable "turn-down" consumption of 15 cu.ft. per hour is readily obtainable.

Applications of the Burner

The following is a list of processes to which the "C.C." burner has been applied so far, either experimentally or in actual production: Annealing; local hardening; bolt heading; steel forging, including stamping, upsetting, billet heating, and rolling; fire welding; brazing; high-speed steel hardening; tungsten wire heating; aluminium melting and maintaining; glass melting and glory holes; tube annealing and tube upsetting; salt tempering and hardening. One of the early experiments using the "C.C." burner was applied to local hardening the faces of hammer heads, leaving the "eyes" in the soft condition. For the benefit of those not acquainted with this hardening process, the two methods usually employed involve the use of the lead bath or the open fire or oven furnace.

The "C.C." burner method involves the use of two parallel sets of burners arranged horizontally opposing each other. The positions of the burners are adjustable to allow for the various sizes of hammers. A very high rate of heat input was obtained when the faces were placed very close to the burner tunnel outlets, the rate falling off as the distance was increased. The hammers are moved past the tunnels, both ends being heated at the same time, and quenched in a tank of water. For the purpose of the experiment each burner block contained four combustion tunnels with air/gas mixture manifolds, fitted with common injectors. The following are the results which were obtained:

Type of hammer.	Time in heating zone. minutes.	Hardness. Brinell.
1-lb planishing	1½	550–600
1-lb. joiners'	1¾	550–600
1-lb. engineers'	2	550–600
2-lb. ,,	2½	550–600
2-lb. lump	3	550–600
4-lb. ,,	3½	550–600

These results and the method of operation were sufficiently attractive for the tool manufacturers to install their own plant, which was to be provided with automatic handling arrangements. The burners were redesigned and fitted with individual injectors having separate gas and air controls for the output required. Messrs. John F. Askam, Ltd., Birmingham, designed and made the feeding machine.

For the "C.C." burner method the following advantages are claimed:

(*a*) Fuel economy (no furnace or bath to heat up). The installation can be put into operation in a few minutes from lighting up.

(*b*) Consistent hardening with automatic feeding.

(*c*) Can be operated by semi-skilled or female labour.

(*d*) More gradual and fracture resistance zones of transition from treated to untreated areas.

Aluminium Melting and Maintaining

An experimental 300-lb. capacity aluminium bale-out furnace was constructed having four vertical four-tunnel burners firing tangentially around the plumbago pot to ensure uniform heating. These 16 burners again emphasize the importance of subdividing the amount of gas required to a number of small burner units. The normal method of heating such furnaces is by one or two burners firing tangentially around the base of the pot, with a combustion space of 1½ in. to 2 in. or more. The combustion space between the pot and the furnace wall in the experimental installation was reduced to approximately ½ in. While this was adequate for the combusted gases—from 1,280 cu.ft. of gas per hour—it was discovered that this limit was too fine to allow for a change of pot. It was decided to increase the combustion space to 1 in. in future furnaces.

This furnace, with the top of the pot open, maintained 300 lb. of aluminium at a temperature of 720°C. with a gas rate of 140 cu.ft. per hour.

The following are the results obtained on a 400-lb. capacity plumbago pot furnace supplied by the Thermic Equipment and Engineering Co., Ltd., which was in actual production fired by four four-tunnel "C.C." burners, as used in the experimental unit.

Aluminium Melting only.

	Cold pot. 1st heat.	Hot pot. 2nd heat.	Hot pot. 3rd heat.
Time required to melt	2 hrs. 20 mins.	1 hr. 55 mins.	1 hr. 30 mins.
Gas consumption	2,300 cu.ft.	1,535 cu.ft.	1,450 cu.ft.
Weight of metal melted	400 lb.	400 lb.	400 lb.
Cu.ft. of gas/lb.	5.75	3.84	3.63
Average gas rate—cu.ft./hr.	984	970	966

Orsat analysis: CO_2, 12.8%; O_2, 0.8%.

Aluminium Maintaining only.

Weight of charge	400 lb.
Temperature	740°C.
Time maintained	4 hours.
Average gas rate	180 cu.ft./hr.
Cu.ft. per lb.	0.45
Orsat analysis	CO_2, 12.0%; O_2, 2.2%.

Tube Annealing.—An experimental furnace was built using "C.C." burners to ascertain the speed at which steel tube could be annealed by the progressive method, or in other words, by continually feeding tube through the heated zone at the speed required to raise it to the desired temperature. The tubes were fed by hand into the preheating end through a 1-in. diameter hole in the brickwork, and from the heating zone through a 1½ in. diameter hole, the hot gases being directed on to the centre line of the tube. The tube emerged at a temperature of 650° to 700°C.

Results.

Time for furnace (burner zone) to reach operating temperature—1,350°C.	15 min.
Gas consumption (4 in. w.g.)—rate per hour	640 cu.ft.
Air pressure	1½ lb./sq. in.
Dimensions of tubes	12 ft. 6 in. long by ⅝ in. o/d. by $\frac{7}{16}$ in. i/d.
Weight of tubes	4¾ lb. each.
Time to anneal one tube	52 secs.
Rate of heating	14.4 ft. per min.
Weight per hour	330 lb.
Consumption of gas per lb.	1.94 cu.ft.

Steel Billet Heating.—A similar furnace arrangement to that described for tube annealing but without a preheating chamber was used for an experiment on steel billet heating. A pair of 3-in. centre six-tunnel burners were opposed 3 in. apart forming the heating zone, 3 in. square by 18 in. long, the waste gases escaping through the charging and discharging holes at each end of the furnace, the aperture at the feed end being 3 in. square and at the discharge end 2 in. square. The billets, 3 in. long by $1\frac{9}{16}$ in. diameter, were fed into the furnace by hand, end on to each other forming a continuous line, making a total of six billets in the furnace at any given time. The speed of feeding was proved to be critical. The correct speed for the billets to be raised to approximately 1,250°C. was at the rate of one billet every 22 seconds. The gas consumption at 4 in. w.g. was at the rate of 1,200 cu.ft. per hour, the air pressure 1½ lb. per sq.in. Subsequent etching and micro-examination of the steel revealed very good results. Very slight decarburization appeared on one side of the billet only, and this may have been caused by one of the burners being out of adjustment.

Steel Forging.—Numerous designs of the smaller types of steel forging furnaces have been built for test purposes to work with drop hammers and forging machines. "C.C." burners have been fitted in many positions varying from firing downwards out of the furnace roof, from one side or both sides, either staggered or opposite to each other, from the back and from the front of the furnace. Figures below 3 cu.ft. of 450 B.Th.U. gas per lb. of 1 in. diameter steel bar heated have been obtained without recuperation, and a hearth loading of practically 500 lb. per sq.ft. per hour. The two outstanding features of forging furnaces, where it is possible to use concentrated combustion, are: (*a*) The comparatively short time required to bring the furnace to temperature—*i.e.*, 10 to 20 minutes from cold; and (*b*) saving in floor space and construction costs, because the furnaces are so compact.

A batch type furnace design using "C.C." burners has now received

the title of the "Cyclone" furnace, and, in this instance, the burners are used for the directional high-velocity gases and turbulence and not for concentrating the combustion into a small space. The reason for building this type of unit was because it is not always convenient to use confined spaces on general forging operations. Forging temperatures usually range from approximately 1,150° to 1,300°C., dependent upon the material to be treated and the type of forging. For the unit an iron casing supported by a tubular underframe in the form of a horizontal cylinder was used. The brickwork consisted of an outer course of 3-in. high temperature-insulating arch bricks, the internal dimensions of the chamber being 19 in. diameter by 24 in. front to back, not including the end walls. Four 1½-in. tiles were evenly spaced to support the hearth tile 24 in. long by 12 in. wide by 2 in. thick, the surface level of the hearth being on the centre line of the cylinder. The guard tiles on each side were 24 in. long by 4½ in. wide by 1½ in. thick, projecting 2½ in. above the hearth level, a gap 1¾ in. wide being left behind the tiles to allow for the travel of the gases. The waste gases discharge to the flue outlet arranged on hearth level at the back. A doorway measuring 12 in. by 9 in. adjustable to suit requirements was also included. One straight line burner assembly of eight tunnels was fixed at an angle of 40° to the hearth, firing tangentially upwards from a position immediately behind the guard tiles on one side of the furnace. The hot gases are directed around the arch ring, over the hearth to the opposite side, and return from the underside of the hearth back to the face of the burners to complete a circular movement, thus avoiding direct impingement of gases on the work to be treated.

Bolt Heading.—Certain kinds of bolt heads are hot forged to a distance equivalent to three diameters of the pins to a temperature of approximately 1,250°C. The conventional furnaces used are of simple design. Through holes in perforated bricks individual pins are inserted to give the desired heated length. During one of the early experiments an attempt was made to prove the value of concentrated combustion for this process, and a very efficient gas-fired four-sided furnace was selected to give output and gas consumption figures for comparison. The primary object was to determine whether it was an economic proposition to replace the furnace feeding four heading machines by a small individual furnace to each machine, thus overcoming the difficulty of right- and left-hand working and to reduce the fatigue of the operators. In this case the operators worked the furnaces as well as their heading machines.

A small experimental furnace was arranged with a three-funnel burner firing downwards out of the furnace roof. The combustion chamber, the size of which was 8 in. by 4 in. by 3 in., reached a temperature of 1,250°C. in ten minutes from cold, with a thermal concentration in excess of 15 therms per cu.ft. An output of nearly 22 gross of ⅜ in. diameter coach bolts per shift of 8½ hours at 5.3 cu.ft. per lb. was obtained.

More recently attention has been given to an automatic furnace machine for pin heating. An experimental unit was built with a hand-operated conveyor, and output figures on ⅜ in. diameter pins were doubled with the same gas rate per hour as the batch type furnace. This was due to load recuperation, and the fact that each pin was discharged from the furnace the moment it reached the required temperature.

Salt Tempering.—"C.C." burners have been applied to a salt-tempering bath which was operated at comparatively low temperatures—*i.e.*, 450°C. These burners were decided upon because of the shape of the bath, and the heavy loading of the steel for tempering requiring a high heat input for rapid temperature recovery. The bath was 1 ft. 8 in. diameter by 7 ft. 10 in. deep. The use of "C.C." burners simplified the construction of a furnace of this type, and a vertical burner assembly of a single line of 22 tunnels was fixed tangentially to the bath. A single stage fan was used to supply the air required at 1 lb. per sq.in.

The brickwork setting was built to allow for a 1-in. combustion space, and four discharge ports into a ring flue at the top of the setting were included.

Competition with Electrical Induction Heating

The concentrated combustion of town gas should assist the Gas Industry in the competition with electrical induction heating. So far the heating times are longer than those obtained in some classes of work using the induction method, but it is possible to produce the "goods" at the speed required, automatically, by heating a length of quantity at a time, as indicated by tube annealing, billet heating, or bolt heading tests, without the very high installation cost of the electrical unit.

Summarizing:—

(1) The practical completion of combustion within the burner tunnel overcomes the difficulties of interference.

(2) From experience, provided a perfect seal is maintained, wrought-iron or mild-steel nozzles do not burn away, in spite of the high tunnel temperatures.

(3) Processes must be selected for the application of "C.C." burners, the higher efficiencies being obtained when direct impingement of the gases on to the work can be employed, or when the gases can be directed into confined spaces.

(4) These burners, which operate satisfactorily at any desired position, even when directly opposed at a short distance apart, will afford more scope in the design of industrial gas equipment. For certain heat requirements, furnaces may be dispensed with entirely, as instanced by the hammer-hardening process.

DISCUSSION

Mr. K. L. PEARCE (President of the Association, Bilston) described the Paper as excellent.

Mr. S. BROCKBANK (Walsall) said they would be even more delighted when they were able to read such an excellent Paper in the Technical Press, for the lecturer had given them information about C.C. burners which they had been eagerly waiting for. The speed of heating tubes naturally interested him, and he noticed that Mr. Palser had reached a speed of 14 ft. per minute. That, of course, was not fast enough. If these burners were to become part of a continuous process, they must be able to heat tubes and anneal them at a speed at which these tubes were being made—*i.e.*, 100 ft. a minute. Was it, he asked, merely a question of multiplying by ¼th in order to attain a faster rate and the required length? Apparently it was, and it should not be very long before they had furnaces available which were capable of heating tubes at the rate of 100 ft. per minute. Mr. Brockbank added that if jobs could be treated in one continuous line, it was something which manufacturers had been particularly seeking. They were also looking for something which would enable them to remove scale from the strip before its conversion into tubes. It had been suggested to him that if some furnace could be devised which would heat the strip at 100 ft. per minute, and then immediately quench it, the scale would disappear, and he wondered whether that had been given consideration. Would not two furnaces instead of one make for a more continuous line?

Mr. PALSER replied that Mr. Brockbank was quite right. It was a question of just adding to the number of burners to give any required speed and length. But it must be realized that feeding was a very critical operation. Working with a temperature head of about 700°, obviously the feeding must be very accurately controlled. The removal of scale had been discussed, and the amount arising out of their experiments was markedly slight. There was one suggestion—whether it would turn out satisfactorily he did not know—that possibly high-pressure water jets at the discharge end of the furnace would suffice to remove the scale. Quenching had been tried, but made no difference.

Mr. BROCKBANK interposed to emphasize that the point he made referred to scale removal before the tubes were manufactured. After passing through the rolling mill, evidence of scale was already there. The present process consisted of pickling before the manufacture of the tube.

Mr. A. C. JENNINGS (Derby) said the Paper took them a long way further than the latest information from America, particularly on application. In connexion with concentration of heat liberation, they had heard of a figure of 600 therms per cu.ft. being obtained. Mr. Palser had given them a figure up to 25 therms, and it would be of interest to know what were his views on increasing that liberation, and whether he thought it of any practical value to do so. Another point regarded the treatment of steel, particularly the consideration of atmosphere. He took it that the mixture in the tunnel was pretty well theoretical. What would happen if one wanted to obtain a reducing atmosphere for any particular process; he supposed it would tend to bring all the flame outside the tunnel. Mr. Jennings also commented on the type of plant used for obtaining less air pressure. He referred to pressure up to 2 lb. per sq.ft. in connexion with the two-stage centrifugal phase which had been used, and asked, Was this going to be more or less standard equipment, or would it need compressor equipment? The only other point he wished to raise was as to there being any possibility of using such types of burners for submerged heating of tanks—that was under-water heating or under-liquid heating.

Mr. PALSER said that in regard to the concentration of combustion, one must not forget that the American figures were based on natural gas with an excess of 1,000 B.Th.U. per cu.ft. He thought there was a practical limit to what concentration they could use, for regard must be paid to the refractories when working up such concentrations. He was aware that the refractory manufacturers were putting forward refractories to withstand a temperature of 1,800°, but he had not as yet had an opportunity of trying them out. On the question of atmospheres, it was quite easy to make adjustments to give any desired atmosphere.

Regarding air pressures, they commenced with a very high air pressure of the order of 10 lb. per sq.in., but soon discovered that this pressure was unnecessary. If they desired to get a concentration up to 25 therms per cu.ft., the ordinary two-stage fan or multi-stage going up to 2 lb. per sq.in. was all they would need for these concentrations. On the question of tank heating, there was no reason why one should not continue from the end of the tunnel metal tubes in the form in which one normally used steam heating coils.

Mr. H. R. SMITH (Birmingham) remarked that the question of therms per cu.ft. depended on how the volume was measured, and for

that reason he did not think the 600 therms per cu.ft. quoted had any practical value.

Mr. J. A. TOMES (Stourbridge) enquired whether the nature of the burners and nozzles was affected by pre-heating the air.

Mr. PALSER, in reply, mentioned that they had conducted experiments in preheating the air, and he could definitely tell them that it did not affect the characteristics of the burners.

Mr. F. A. REYNOLDS (Wolverhampton), referring to his own experience of metal melting, mentioned the use at Wolverhampton of two burner blocks with four burners for aluminium zinc melting, and after the initial heating up of the furnace it was found that two of the burners could be cut out and the two others nearly out, and they carried on with these two. His conclusion was that there were too many burners for the furnace used. In the early days they built a furnace for spring washer hardening. It comprised 16 of these 3-hole burner blocks fired downhill with a 4-ft. long and 7-in. wide tunnel. It gave marvellous results. There were no flues, except at the ends of the furnace where the work went in and came out. Perfect combustion was obtained, and a temperature of 900° was maintained with absolutely flameless combustion, which yielded a perfect job. Owing to reorganization this furnace had not yet been put to work on regular production, but he did not doubt that when it was, some phenomenal figures would be reached. Mr. Reynolds commented on the fact in respect to forging and upsetting that the new furnaces required few bricks compared with those built some years ago, and with "C.C." burners they were able to secure a greater output with less consumption of gas. Speaking of high-steel hardening, Mr. Reynolds said they had reached 1,300° in 20 minutes in the bottom muffle, and 800° in the top muffle, which was good going. Commenting on bricks and the expensive nature of their material, Mr. Reynolds pointed out that they were now experimenting with bricks made in a special casing material, which left a substantial core in the middle of the original material to take this intense heat. In conclusion he asked if there were any relation between the size of the tunnel and the size of the burner nozzle as regards diameter and length. For instance, if one put a ¼-in. nozzle in a tunnel 7 in. by 1 in. diameter, and then used a ½ in. nozzle to get bigger burners, would one increase the size of the tunnel?

Mr. PALSER replied that it had been suggested that there were more burners fitted to an aluminium melting and maintenance furnace than were necessary. He thought that he had indicated that these furnaces were required for melting, and that being so one must have a fairly high gas capacity to do the job in reasonable time. Sometimes they had to burn gas of the order of 1,200 cu.ft. per hour and that meant 16 burners. If the furnace were designed and used only for maintenance he would say, of course, cut the burners down by half, but the experience was that firms always did melting as well. On the questions of diameter and length they had tried various lengths and diameters, but they had to go back to that of six or seven to one. They could vary the consumption in the tunnel by manipulating the jet or nozzle and air pressure. They had a wide range, and went up to about 180 cu.ft. and down to 15 cu.ft. He thought they would agree that that was a wide range for a single tunnel.

Mr. H. R. HEMS (Birmingham) said that they were facing a new technique. Mr. Palser had referred to the work of Americans, and there was one present at this meeting who had seen some of the American burners, which they had not had an opportunity of obtaining. They hoped, however, to have some of the actual burners soon, so that they could make some comparison of the results. The point that he wanted Mr. Palser to bring out was that they had arrived at a new burner technique instead of a furnace technique. The point to be borne in mind in accepting burner technique was they wanted the furnace and they wanted the burner. They wanted the furnace to be applied to the new type of burner so that it could afford the fullest advantage of the increased efficiency of application with the burner, and to do that was where they could take the fullest advantage of the reduced combustion space. His answer to anyone who came along and suggested they wanted this speed heating burner was that metallurgical considerations must be left to those who wanted it. If, in the course of heating a piece of metal, ferrous or non-ferrous, in minutes instead of hours, they did something to it, then the user must take the responsibility for the metallurgical condition which ensued. Mr. Palser did his work in a practical way; he built up these burners, and this was not the only thing that he had built up in gas application.

Dr. C. M. WALTER (Birmingham) said he could assure the meeting that Mr. Palser had many other ideas for the practical application of the "C.C." burner which he had worked out, and they might get a further Paper on this very interesting subject.

Mr. L. P. BROOKS (Managing Director, John Garrington & Sons) said he could only speak from the users' end, but he thought sometimes that those who could speak of the ultimate effect could make valuable contributions. He thought they were going to get more modern forging plant. They had in their shops a motley collection of hot boxes, and the type of labour was not the best that could be desired. He felt there was a psychological end that was going to develop from the work which they were doing. They would be able to employ a more intelligent type of person. That was what they were looking for, and that was what he felt they were on the road to offering with this localized heating. Scaling by water jets, he said, was a general practice in America, and seemed to be very successful. He pointed out that the more the speed of production was intensified, the less time they could spend on removing scale. As far as industrial applications were concerned and the attempts to mechanize equipment, which was very important, they seemed to be very much ahead of the Americans.

Mr. A. HILL proposed and Mr. WATKINS (Coventry) seconded a cordial vote of thanks to the Author.

Physical Society's Exhibition

An important annual event before the war to the engineer and research scientist was the exhibition of Scientific Instruments and Apparatus held under the auspices of the Physical Society. It was justly renowned for the opportunity it gave to research workers to become fully acquainted with the progress made in all fields of science, and also for the instrument manufacturers to exhibit the latest development in their apparatus. During the war the exhibition was discontinued. Now, after an all-too-long absence, it has again been held at the Imperial College of Science and Technology from Jan. 1–3. Much work has been done and considerable progress made during the past few years, and it was not surprising that it was met with enthusiasm.

Once again the Gas Light and Coke Company provided on its attractive stand evidence of the valuable work carried out by its laboratories. It comprised various appliances, all of which were ably described and most of which were demonstrated. Perhaps the most interesting exhibit was the "Pilotstat" Flare Safety Device, which was being shown for the first time. It is designed to shut off gas supplies automatically in the event of pilot failure or temporary cessation of supply. A thermo-couple is heated by a pilot jet. The e.m.f. generated, of the order of 17 mv., energizes a magnet capable of holding open the main gas valve. At the pressure of a button the gas valve is forced off its seating and on to a magnet. Gas is admitted to the pilot but not to the main burner. When the thermo-couple is hot enough to energize the magnet, the button is released, whereupon the gas valve is held open and a spring pulls a plate off the seating, admitting gas to the main burner. Gas will flow until the pilot is extinguished when the thermo-couple cools, the magnet is de-energized, and the valve is released from its magnetic seating. As supply cannot be reinstated without a manual operation, danger of explosion is eliminated. Also shown was the "Protectoglo" Combustion Safeguard System, which is a modification of the "Pilotstat." Both are made by Honeywell-Brown, Ltd.

Other exhibits included a device for testing catalytic igniters, an aeration test burner made by Alexander Wright & Co., and designed to record the effect of minor variations in the composition of town gas on the shape of flames in an aerated burner, and a scale model black emitter radiant heat tunnel used for the quick drying and curing of paint finishes on metals. Of a more novel nature was the Double Eupatheoscope—a robot the surface of which is maintained at a temperature similar to that of a clothed human being, and which reacts to the temperature of a room warmed by a directional source of heat, registering both back and front temperatures.

George Kent, Ltd., exhibited a ring balance recorder fitted with a new 6-figure straight-reading integrator. Other firms of interest to the Gas Industry included the Cambridge Instrument Co., who exhibited a compact gas regulator, and the Rotameter Manufacturing Co., Ltd., showing a G.L.C. meter test burner designed by Mr. C. R. Austin.

To Bridge the Gap caused by six years' suspension of publication *West's Gas* is dividing its "References" into two sections, one covering "Back Numbers" and the other "References." Thus in the course of a few issues, commencing with that for December, an attempt is being made to ensure that nothing of outstanding importance during the war years shall remain unrecorded in what has for long been appreciated as an interesting and useful feature.

The Central Administration Staff of the United Kingdom Gas Corporation, Ltd., were the guests of the Directors at a Victory Dinner at Swettenham Hall, Congleton, on Dec. 20. Unfortunately Colonel W. Moncrieff Carr, Managing Director, was unable to be present, owing to indisposition, but Mr. W. Hodkinson, General Manager, in proposing a vote of thanks to the Directors for their hospitality, spoke of the progress made by the Corporation since its inauguration 10 years ago. The Managing Director, who had intended to respond to the toast, had written a reply which was read by Mr. J. W. Rodgers, Sales Manager, and told of his appreciation of the loyalty of the staff and of the confidence which should be shown in the future of the Gas Industry.

LONDON AND SOUTHERN DISTRICT JUNIORS

Design and Installation of Small Industrial Canteens*

By DAVID G. WINSLOW, Assoc.M.Inst.Gas E.

(London, Midland and Scottish Railway Company)

INDUSTRIAL canteens and communal feeding are playing an important role by assisting in the distribution of food and by ensuring that a large proportion of workers get a good hot meal at a reasonable price. Many of the canteens installed so far have had to depend on utility equipment. Again, owing to the need for conserving material and labour, the buildings for the canteens have had to be of a temporary nature, often being far short of the ideal. The shortage of suitably trained staff for operating the canteens has also proved another difficulty. Altogether these canteens built during the war are to be considered purely as a wartime expedient. In spite of these disadvantages, however, they are doing a really good job of work.

As the change-over from war to peace conditions takes place, the demands on particular canteens will change. Better quality equipment will generally become available, and better building materials and methods will be possible. As a result, many canteens will probably be rebuilt, re-designed, and re-equipped. The demand for a canteen in a works will depend on many factors, but it is certain that its provision will continue in the future to rank very high in the list of works amenities.

The following is the result of experience gained in designing and equipping a large number of small industrial canteens for dealing with groups varying from 50 up to 400 persons. Most of the principles applying to industrial canteens apply equally well to all kitchen problems. In the case of hotel kitchens, for example, where greater variety and speed are called for, the main differences lie in the nature and size of the cooking appliances and in the serving arrangements.

General Principles of Kitchen Layout Design

The most important consideration in layout design is the movement of the kitchen operatives in the various stages of meal preparation. The main forward movements in a kitchen are as follows:

(*a*) From delivery into storage accommodation.
(*b*) From storage to preparation.
(*c*) From preparation to cooking appliances.
(*d*) From cooking appliances to service.

The main backward movements are:

(*e*) From seating portion to wash-up.
(*f*) From wash-up to crockery racks or back to plating table.

In addition there are various sideways movements, the main ones being:

(*g*) Utensils from cooking appliances to wash-up and back.
(*h*) From tea preparation to wash-up and back.

In order to design a kitchen with the maximum convenience conditions and therefore with minimum walking distances these movements must be carefully kept in mind. It has been found in practice that a greater distance than 9 ft. between any two consecutive operations involves not only an uneconomic use of building space, but also considerable wastage of energy on the part of the kitchen operatives. A minimum walking clearance of 4 ft. is necessary to prevent the operatives from colliding with the appliances and preparation tables.

In view of the book-keeping associated with the running of a canteen, it is very desirable that a supervisor's office should be provided. Where this is done the office should be so positioned that the supervisor can keep entries and exits to the stores under observation. At the same time a window in the office should be provided so that the supervisor can watch progress in the kitchen.

Separate preparation bays or rooms should be provided for the various preparations. Bays or rooms are preferable in order to keep the staff engaged in preparation from obstructing those moving in the main kitchen area. They are also a means of providing additional wall space for fixed benches.

Though there are many systems for the siting of appliances and preparation bays, they are all combinations and modifications of four main methods:

(*a*) The main cooking equipment in a central group with the stores and preparation bays arranged around three sides, the plating and service being on the fourth side.

(*b*) The main cooking equipment along one wall in a line, with the preparation bays opposite, the store one end and the plating and service at the other end.

(*c*) The main cooking equipment in two lines with the preparation bays behind the lines. The main forward movement is between the two lines of equipment. (This method is virtually the same as having the appliances grouped separately by their own preparation bays.)

(*d*) The main cooking equipment placed around three sides of the kitchen with a general preparation table in the centre, the preparations being carried out externally to the kitchen.

When use is made of existing accommodation, it will be readily realized from the shape and size available for the kitchen the particular system or combination of systems that can be used. In other words, the system to be adopted will largely decide itself.

The position of the wash-up section in all systems should be near to the service counter and plating table. The crockery, after cleaning, is stored on a rack, which should be easily accessible from the plating table. The pot and pan wash-up can be alongside the crockery wash-up, if conveniently situated for the appliances, otherwise a separate position must be used.

It has been found in practice very necessary that a partition should be provided between the serving counter and the kitchen in order to prevent those obtaining their meals from seeing into the kitchen. The sight of uncooked food and food being prepared for cooking apparently has an unappetizing effect on many people, and the lack of privacy has often a bad effect on the kitchen staff.

Space Requirements.

A preliminary guide to the area required for the kitchen is given in Table I. The areas given include for kitchen, store, vegetable store, and supervisor's office.

TABLE I.—SPACE REQUIREMENTS.

Size of kitchen (number of main meals).	Area of kitchen (sq. ft.).
50	460
100	750
200	1,120
300–400	1,300

In the seating portion an area of 10 sq. ft. per person should be allowed. The total area will, of course, be governed by the numbers to be seated at one time.

TABLE II.—MAIN EQUIPMENT FOR KITCHENS.

Equipment.	50.	100.	200.	300–400.
Range	1 double oven	1 double oven	1 four oven	1 four oven
	Each oven 24 in. wide × 24 in. deep × 28 in. high.			
Boiling table	—	3 ft. × 2 ft. 6 in. wide	4 ft. × 2 ft. 6 in. wide	5 ft. × 2 ft. 6 in. wide
Boiling pan	—	1 20-gall.	2 20-gall.	3 20-gall.
	Each fitted with 2-tier baskets and counter-balanced lid.			
Steamer	—	1 single oven	1 double oven	1 double oven
	Each oven 18 in. wide × 24 in. deep × 24 in. high.			
Fish fryer	—	1 single pan	1 double pan	1 double pan
	Each pan 24 in. wide × 24 in. long × 7 in. deep.			
Water heater	1 10-gall. storage	1 20-gall. storage	1 30-gall. storage	1 60-gall. storage
Potato parer	1, hand operated	1, power operated	1, power operated	1, power operated
Chipper	1, hand operated	1, hand operated	1, hand operated	1, power operated
Pastry mixer	—	—	1 power operated	1, power operated
Slicer	1, hand operated	1, hand operated	1, hand operated automatic	1, hand operated automatic
Bain maire	4 ft. × 2 ft. 6 in. wide	4 ft. × 2 ft. 6 in. wide	5 ft. × 2 ft. 6 in. wide	5 ft. × 2 ft. 6 in. wide
Hot closet	4 ft. × 2 ft. 6 in. wide	6 ft. × 2 ft. 6 in. wide	12 ft. × 2 ft. 6 in. wide	16 ft. × 2 ft. 6 in. wide
*Tea boiler	One	Two	Two	Two
Refrigerator	10 cu.ft.	20 cu.ft.	50 cu.ft.	100 cu.ft.

* Capacity to depend on requirements.

* From a Paper read at Gas Industry House on Dec. 14, 1945.

Choice of Equipment.

The factors which should influence the choice of a particular appliance are:

(*a*) Efficiency.
(*b*) Mechanical strength and durability.
(*c*) Ease of adjustment and maintenance.
(*d*) Ease of cleaning.
(*e*) Appearance.

Generally, these factors can be assured by dealing with a reputable manufacturer. The ease of cleaning and the appearance can be many times improved by the use of vitreous enamelled surfaces. Manufacturers of standing have considered very carefully the question of ease of cleaning, but in the past in many instances insufficient thought has been given to appearances. Appearance, though it may not affect the other factors, is none the less a very important psychological factor in that it affects the pride and care that kitchen staff will show towards their equipment.

The main equipment required for the kitchens for various-sized canteens is given in Table II.

In Table III are given the main cooking appliances shown in Table II, with examples of their food-cooking capacities.

Separate preparation bays are required for the preparation of vegetables, meat, pastry and fish. Table IV sets out the requirements for each bay.

TABLE III.—Capacities of Main Cooking Equipment in Table II.

Equipment.	Food.	Total capacity.	Portion per person.	Total portions.
Oven 24 in. × 24 in. × 28 in.	Meat	80 lb.	6–8 oz.	160–210
Boiling pan, 20-gall.	Potatoes	120 lb.	6–8 oz.	240–320
	Greens	60 lb.	4–5 oz.	190–240
Steamer oven 18 in. × 24 in. × 24 in.	Potatoes	160 lb.	6–8 oz.	320–430
	Individual puddings, 3 in dia.	240	1	240
	Pudding rolls	—	1 slice	360
Fish fryer, 1 pan, 24 in. × 24 in. × 7 in.	Fish	14 lb. per 8 min.	5 oz.	45 per 8 min.
	Chips	16 lb. per 8 min.	6 oz.	45 per 8 min.

TABLE IV.—Preparation Bay Requirements.

Preparation bay.	Bench space.	Sinks.	Special bench.	Labour-saving appliances.
Vegetable	Up to 200, 12 ft. × 2 ft. Above 200, 16 ft. × 2 ft.	2	—	Potato parer. Chipper.
Meat	Up to 200, 15 ft. × 2 ft. Above 200, 18 ft. × 2 ft.	1	Chopping block, 2 ft. × 2 ft.	Slicer. Mincer.
Fish	—	1	Slate bench, 4 ft.–6 ft. × 2 ft.	—
Pastry	Up to 200, 12 ft. × 2 ft. Above 200, 16 ft. × 2 ft.	1	Marble slab, 3 ft. × 2 ft.	Above 200, mixer.

Storage Accommodation

The size of the storage accommodation will depend on the amount to be stored, which will depend in turn on the frequency of deliveries. Table V sets out the size of the dry store, vegetables stores and refrigerator found adequate during the war. The dry store areas shown allow for the refrigerator to be included.

TABLE V.

Size of kitchen.	Dry store.	Vegetable store.	Refrigerator.
50	26 sq. ft.	15 sq. ft.	10 cu.ft.
100	36 ,,	25 ,,	20 ,,
200	70 ,,	40 ,,	50 ,,
300–400	140 ,,	80 ,,	100 ,,

The dry store is fitted with shelves, while the vegetable store is fitted with bins and duck boards on the floor.

The plating section is placed near to the service counter, and consists of a suitable plating table and bain marie. The bain marie is used for keeping food, gravies, and custard hot during the plating operation. In the larger canteens, bains marie with separate containers and carving wells are worth considering. The service counter consists of a hot closet, a section of counter for serving cold sweets, and a tea-making and serving section. Barrier rails for traffic control are fitted in front of the counter, the arrangement depending on the peak custom. For canteens of the size under consideration the hot closet can be fitted as part of the counter.

The boiling water appliances chosen will depend on the demand and the period over which it is spread. The practice generally is to use an instantaneous type of boiler with its maximum output capable of dealing with the peak demand. Unfortunately, with the present types of boilers available, unless the demand is even for continuous periods the efficiency is extremely low. Usually, however, the efficiency is sacrificed for convenience.

The best arrangement at present possible is to use two gas-heated urns of the insulated type, operated alternately. Boiling water can be always available with this system, and it is a simple matter to regulate the quantity available after experience has been obtained. The efficiency is very much higher, and the appearance of some models is vastly superior.

It is essential that an adequate supply of really hot water is available to meet the demands of the kitchen. Various types of water heaters are available, but the most satisfactory results in the case of canteens are obtained with storage water heaters, either of the combined type, or by using circulators connected to a lagged storage cylinder. Table VI gives the storage capacity found satisfactory for the various sized canteens, the water being heated to 140°F. with a recovery rate of the capacity per hour.

TABLE VI.

Size of canteen.	Hot water storage.
50	10 gallons
100	20 ,,
200	30 ,,
300–400	60 ,,

The maximum rate of recovery required is determined by the maximum user. From tests made on a number of canteens catering for different numbers, the washing-up period lasts for approximately two hours, and the amount of hot water used has been found to be approximately 0.30 gallons raised to 140°F. per meal.

In the larger sized kitchens, the maximum rate of recovery which is only necessary during the peak user can often with advantage be cut down during other periods by the use of several circulators connected in parallel to the storage cylinder. The circulators are separately controlled.

Heat losses should, of course, be reduced to a minimum by efficiently lagging the hot water pipes, expansion pipe, storage cylinder and connexions.

It is now being realized that ventilation problems generally cannot be satisfactorily dealt with merely in terms of air changes per hour. In determining the volume to be removed, a figure of 20 cu.ft. of air per minute for each cu.ft. of gas burnt per minute at the maximum should be taken. This figure has been calculated from the volume of products produced and adding to it the maximum amount of steam that can be produced per minute. The general ventilation of the kitchen must be considered independently of the appliance ventilation, since there will be times when the latter is not in operation. The problem is only one of a normal natural ventilation scheme increasing the air movements necessary to dissipate the heat radiated by the appliances. Additional care must be taken that the high-level outlets are at the highest point of the kitchen to prevent the formation of pockets of steam and products of cooking, &c., that may escape the canopies. If sufficient outlets are so provided it is then not necessary to work to very high velocities across the mouth of the canopy. Efficient schemes have been installed along these lines where the maximum velocity anywhere across the mouth of the canopy is not greater than 10 ft. per min.

The total ventilation requirements can be met by either natural or mechanical means. It is obvious that where possible natural ventilation should be used, since mechanical ventilation entails higher running, installation, and maintenance costs.

The underside of the canopies provided over the appliances should be at least 6 ft. 3 in. from the floor level and should overspan the appliances by at least 9 in. Condensate channels should be provided to prevent condensation dripping on to the floor and kitchen staff. It has been found unnecessary to provide a drain-off cock, since the condensation occurs only during the lighting-up stage, when the canopy is cold, the condensate being subsequently driven off when the canopy warms up.

In most cases it will be advantageous for one contractor to be responsible for supplying the gas equipment, the labour-saving devices, and carrying out the gas, hot and cold water and ventilation installation. This will mean that in the case of a gas undertaking carrying out installation work it should be responsible to the consumer for carrying out all the work, sub-contracting that part outside its own capabilities. When the installation pipes have been fitted and lagged they should be painted with the relevant colours in accordance with B.S.S.617 and a colour reference chart suitably placed in the kitchen. The need for the closest liaison between the installation engineer and the person responsible for the building design cannot be over-emphasized. It is only with co-operation from the very outset that the best results will be obtained with the minimum of alterations and costs.

Running Costs

It is very important that the cost of the meals produced should be as low as possible. This factor in the success of communal feeding will grow increasingly important as restrictions on food grow less. There are, of course, many circumstances contributing to this cost, of which cost of raw food, efficient working consequent upon good kitchen design, the correct choice of equipment and good management are among the most important. An attempt has already been made in this Paper to indicate the points to be considered in design and choice of equipment. Good management can only be achieved by the employment of a fully qualified supervisor. Such a supervisor

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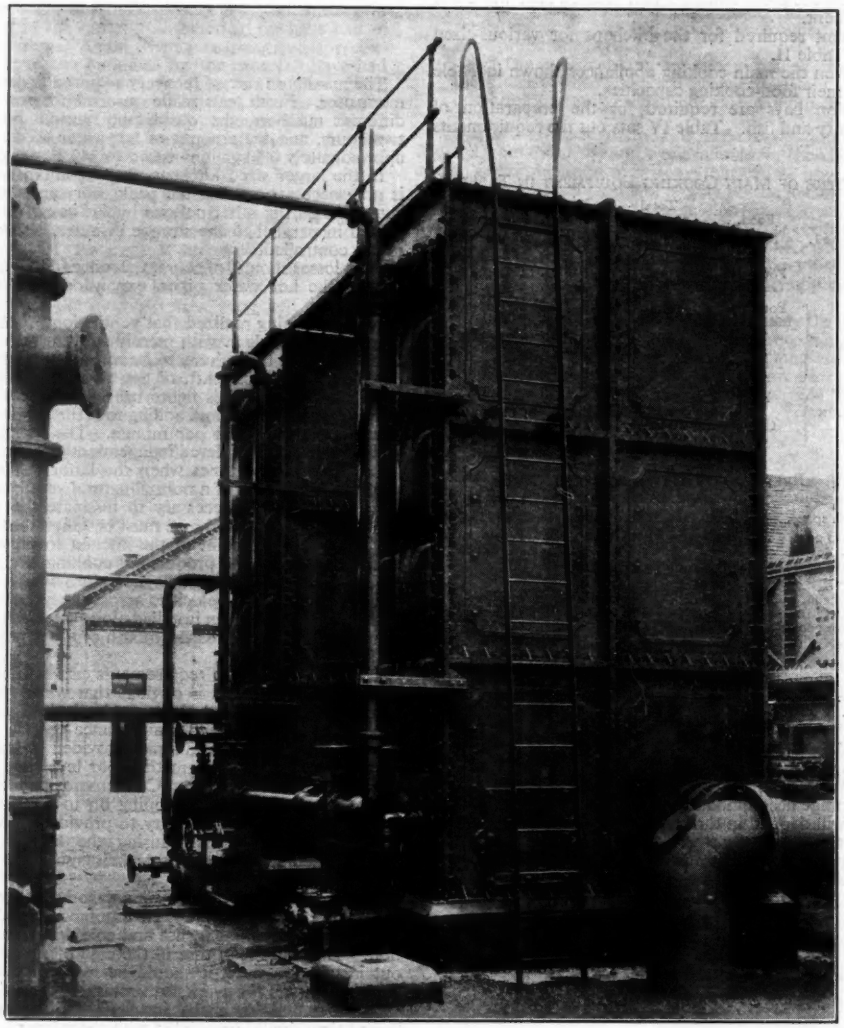

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will be fully aware of the need to economize in the use of fuel both from the cost per meal basis and in the national interest.

A series of tests have been carried out on a number of canteens in which careful observations were made of the various operations in preparing the complete meal,* together with the subsequent washing up. Readings of the gas consumption were taken. As would be anticipated, the larger the number of meals prepared, the lower were the B.Th.U. per meal.

For a particular size canteen, the efficiency increases with additional numbers of meals to a maximum at the maximum capacity of the kitchen. For a larger number of meals, a larger kitchen—*i.e.*, one having a greater cooking capacity—would be necessary. It was originally expected that the efficiency would drop with the larger kitchen and again increase as the numbers of main meals increased. However, within the limits of the experiments this was not so. This means that though the efficiency increases with the numbers of meals, it does so irrespective of the size of the kitchen. On further consideration of the detail results the reason for this is that for the larger kitchens instead of larger appliances being installed, increased numbers of the smaller appliances were added.

The results of the tests, so far as they have been taken, apart from the actual consumption figures, show that it is better to have banks of small units of appliances rather than large single appliances. This has also the advantage of improving the quality of the cooked food.

In conclusion, the need for expert and regular maintenance of all kitchen equipment and installation cannot be overstressed. The cost of such maintenance is well repaid by the increased life of the equipment and by minimizing the risk of a breakdown. Here, again, the consumer will prefer to have one contract for all the maintenance, and in the case of the gas authority carrying out this work it will mean sub-contracting as necessary. The continued contact and interest that such maintenance implies will be of great advantage both to the consumer and to the gas authority.

DISCUSSION

Mr. E. W. B. DUNNING (Gas Light and Coke) thought that the gas consumption figure given by the Author for each meal served was somewhat high as the average domestic consumption was 5 cu.ft. per meal served. Possibly this difference could be accounted for by the long period over which meals were served—*i.e.*, two hours, and a lack of suitable staff. Large units, it was true, were more efficient than a number of small units, but only if the large units were working to capacity. In drawing attention to possible causes for waste of gas, Mr. Dunning said that reductions could be effected by the use of even more efficient appliances, fuller application of the thermostat, and the provision of automatic ignition. If the latter were more general, he felt there would be less reluctance on the part of staff to turn out gas burners when not in use. But any reduction in gas consumption would be in vain, he said, if it were made at the cost of convenience.

Miss GODBY (Ministry of Labour) said that canteens would continue in vogue now that the war was over, but with a future greater availability of food, the post-war would be improved. This must be borne in mind for future planning. She was of the opinion that the future trend would be towards the cafeteria system, as in future the public would demand quicker service.

Miss GARRARD (Industrial Welfare Centre) wished to know whether the figures given in Table III referred to weights of cooked or unprepared food; in any case she thought the figures a little over-stated.

Mr. J. E. COOPER (Gas Light and Coke) wondered whether the Author had considered vertical as well as horizontal movement in his planning of kitchens. This was important, and he asked Mr. Winslow if he had considered it worth while to employ a time and motion study engineer in the matter. The employment of such an expert in these circumstances was essential. Dish-washing machines had not been mentioned, and he wished to know if these were not essential. Finally, did the Author find that canopies were inclined to "spill" the products of cooking?

Mr. W. JOHNSON (Wandsworth and District) thought that the Paper tackled the question of costs very thoroughly, and he found himself in complete agreement with the data given. He stressed the necessity for screening the kitchen from the dining hall. On the subject of washing machines he thought these were essential where the number of persons catered for exceeded two hundred. Reverting to the question of cost, a Ministry of Fuel report on canteens catering for from 100 to 1,600 stated that the average gas consumption per meal cooked was 5 cu.ft., or, if gas were also used for providing the necessary hot water, 7 cu.ft.

Mr. A. LONG (Gas Light and Coke) did not find himself in agreement with Mr. Dunning's statement that the costs for meals cooked for between 100 and 250 persons were high. Tests carried out in the speaker's area showed a consumption of 8 cu.ft. per meal cooked. He had felt that such a figure was too high and that it could be brought down lower. Eventually a figure of 3.5 was obtained. He thought a boiling pan with a quicker recovery was a necessity.

* Meat, two vegetables, and sweet.

Mr. C. OSBORNE (Gas Light and Coke) suggested that high costs were the result of boiling pans not being put to their right purpose. He had found the Author's concluding remarks a trifle confusing where it was stated "that though efficiency increases with the number of meals, it does so irrespectively of the size of the kitchen." Surely if a kitchen were not working to capacity costs would be very high.

Mr. COOPER (Radiation, Ltd.) observed that much of the contents of the Paper was influenced by the war period. One appliance overlooked by the Author was the griller or toaster, and he felt that in the present post-war period grills were going to be found more often "on the menu." It was short-sighted to regard the efficiency of the kitchen from a thermal view-point only. Effectiveness, general attractiveness, and design counted for much. In conclusion, Mr. Cooper claimed that the Industry had the best appliances available, but the advantage of their possession would be lost were proper maintenance not carried out.

Mr. MORGAN (London, Midland, and Scottish Railway) suggested that the problem tackled by the Author was largely influenced by the "spread-over" of two hours during which meals were served, and he therefore felt that costs given in the Paper could not fairly be compared with those obtained from other installations. Regarding maintenance, the L.M.S. had arranged a strict "roster" with gas undertaking and manufacturer concerned. He preferred a manufacturer to carry out this work, as he thought that they did it better than the undertaking. The lay-out of the L.M.S. canteen had been dimensionally governed by the limitations imposed by the Ministry of Works. For hot-water supply he found that a very satisfactory arrangement was a circulator fitted to heat the water in a properly lagged storage tank.

Mr. T. V. GARRUD (Gas Light and Coke) said that whatever opinions existed at the meeting with regard to the Author's costs, the figures presented were "factual," but he thought that a clue to the reason for this divergence was provided in the opening paragraph of the Paper, where it was stated that "owing to the need for conserving materials and labour, the buildings have had to be . . . short of the ideal."

The Author Replies

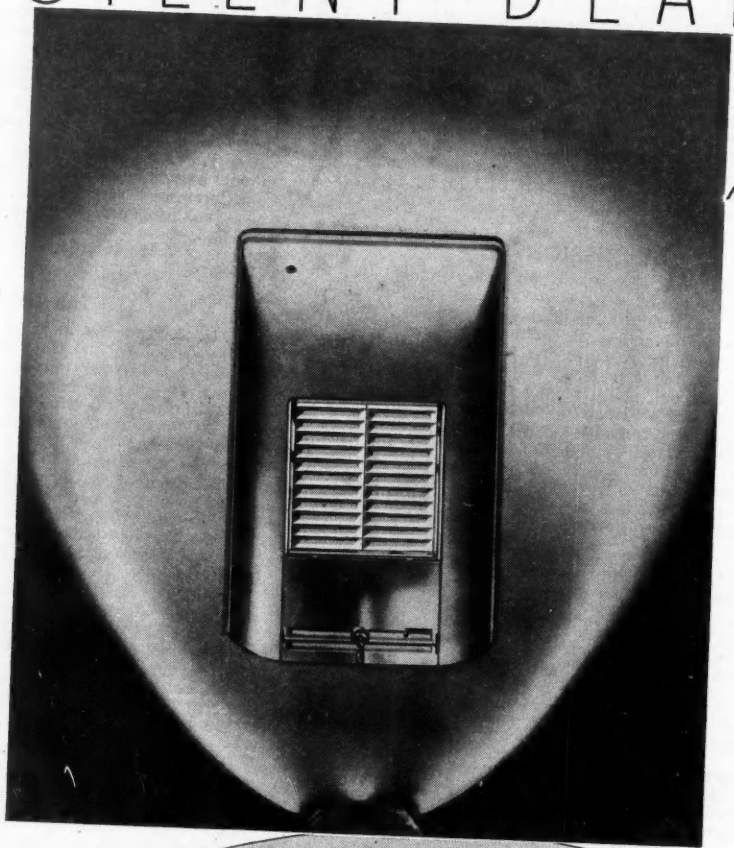
Mr. D. G. WINSLOW, in reply, emphasized that he had been speaking as a consumer, and the question of costs had to be considered with due regard to the running conditions in a canteen. The figures he had given had been borne out in a great number of cases, and had received further verification from results obtained in other canteens. Lower figures could be obtained by using less equipment, but only at the cost of convenience. An excess of hot water led to waste, and the storage capacities stated in his Paper had proved satisfactory. Mr. Cooper's point of the time and motion study engineer had not yet arisen because time had not yet permitted of the employment of this expert, but the Author had no doubt that his services would lead to very beneficial results. He anticipated trouble with staff, however, were such a step taken. On the question of canopy "spillage," he did not think it greatly mattered if the products of cooking did "spill" as long as surfaces on which condensation could take place could be avoided. He had not mentioned dish-washing machines because he did not consider they were justified in installations of the size described by any saving in cost. Mr. Osborne had spoken on hot-water supply. The L.M.S. had originally used instantaneous tea-boilers, but "furring-up" gave a great deal of trouble—efficiencies of less than 16% being known—and he thought great possibilities existed here for improvement.

Aluminium Specifications

Many new specifications covering aluminium and its alloys have been issued in recent years. All current specifications issued by the British Standards Institution and the various Government Departments have been assembled in a volume entitled *Standard Specifications* (No. 402), just published by the British Aluminium Co., Ltd., whose temporary head office is at Salisbury House, London Wall, E.C. 2. The publication, which affords a concise record for the reference of aluminium users, includes the official Aircraft Specifications issued by the British Standards Institution (all of which bear the code letter "L"), the D.T.A. series, issued by the Directorate of Technical Development of the Air Ministry (each of which bears the prefix "DTD"), the BS/STA 7 schedule compiled by the Ministry of Supply for the use of all Government Departments (excluding the Air Ministry and the Ministry of Aircraft Production) and issued by the British Standards Institution (marked by the letters "A" for aluminium, "AC" for cast alloy, and "AW" for wrought alloy), the B.S.I. General Engineering Series for civil use (the specification numbers being qualified by the letters "BSS"), and the L.A.C. specifications compiled by the Light Metals Control, which cover the use of secondary casting alloys (defined by the letters "LAC").

Copies of the B.S.I. specifications can be purchased from the British Standards Institution, 28, Victoria Street, S.W. 1; the D.T.D. and BS/STA 7 specifications from the Stationery Office; and the L.A.C. series from the Light Metals Control, Ministry of Aircraft Production, Banbury, Oxon.

The "SILENT BEAM" fire



NEW WORLD
Gas Appliances

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market Jan. 14.

There are no changes to report in the prices of Coal Tar Products since our report dated Dec. 28.

Maximum prices fixed by S. R. & O. 1945, 1572, are as follows:—

Coal tar naphtha from 1s. 11d. per gall. for the 90/200 (unrectified) grade to 2s. 11d. per gall. for the 96/160. Xylole: 3s. 3½d. to 3s. 6d. per gall. according to grade. The naphtha and xylole prices are for 1,000 gall. lots delivered buyer's address in bulk. Toluole 2s. 4d. to 3s. 2¼d. per gall. *ex* works in bulk in 1,000 gall. lots.

Under S. R. & O. 1943, 1528, prices for cresylic acid range from 3s. 6d. per gall. for refined acid D grade to 5s. per gall. for acid containing 52/53% metacresol. Phenol (carbolic acid crystals) 9½d. to 11½d. per lb. Creosote for timber preservation 5½d.; benzole absorbing oil 6½d. to 8d.; creosote for disinfection making 10d. to 1s. 7d. per gall.; all *ex* seller's works in bulk for minimum 800 gall. lots.

Naphthalene prices are controlled by S. R. & O. 1944, 1051.

Road tar 5½d. per gall. in buyer's tanks at seller's works. Coal tar pitch for briquette-making, 70s. per ton.

For such quantities of products as are available for export and for which licences can be obtained, higher prices can be realized.

The Provinces Jan. 14.

The average prices of gas-works products during the week were: Pitch, 70s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6¾d. per gallon; pure, 3s. 2¼d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by S. R. & O. 1943, 1538, and for naphthalene by S. R. & O. 1944, 1051. Prices for road tar were increased by a half-penny per gallon by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

The bulk of the pitch produced in this country is required for home trade purposes, but certain quantities are being sent at higher prices to Allied countries with the approval of the Coal Tar Control. So far as creosote is concerned the bulk is required for essential purposes, at controlled prices. With regard to hydrocarbon oils, the prices remain fixed, although there is more freedom than was previously the case.

Scotland Jan. 12.

A steady throughput is maintained. Refined tar*: Yield to Distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality.* 5½d. to 6½d.; hydrogenation oil,* 5¾d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic maximum prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Under the stimulus of hopes about the outcome of the United Nations Organization, markets closed very cheerfully last week. British Funds were a particularly strong feature and the majority of other sections were also firmer.

The Gas Market continued somewhat drab, and a few issues recorded further depreciations in value. Two companies operating abroad, however, *viz.*, Imperial Continental and Montevideo both made small gains, while in the Sheffield list the three Great Grimsby Stocks each closed 10 points higher.

The following were the changes in price last week:

PROVINCIAL EXCHANGES

Great Grimsby "A"	185—195	+10
" " "B"	185—195	+10
" " "C"	175—185	+10

OFFICIAL LIST

Associated Gas & Water 4½ p.c. Red. Cum. Pref.	19/—21/—	—/6d.
Bournemouth 4 p.c. Deb.	99—104	—1
Commercial 5 p.c. Deb.	110—115	—2
Gas Light Units	20/6—21/6	—/3d.
Imperial Continental Ord.	107—112	+2
Montevideo Ord.	111—116	+2
Severn Valley 4½ p.c. Cum. Pref. (Red.)	20/—22/—	—/6d.
Ditto 4 p.c. Cum. Pref.	19/6—20/6	—/3d.
Wandsworth 4 p.c. Pref.	99—102	—2

SUPPLEMENTARY LIST

Brighton 5 p.c. Deb.	113—118	—2
Cambridge "B"	135—140	—5

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FULL particulars of these spaces can be obtained on application to the Publishers. They are designed principally for the use of the firms whose display advertisements cannot be included owing to paper rationing.

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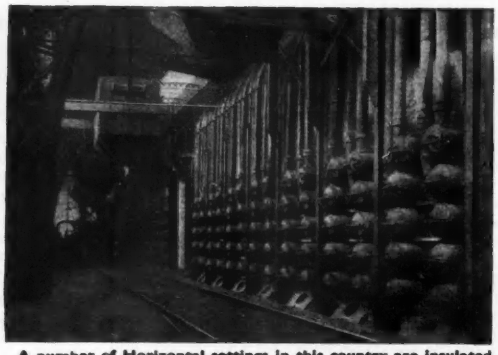

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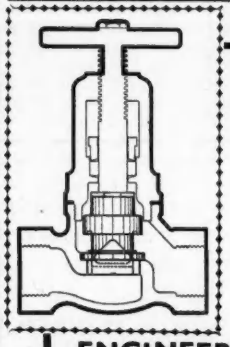

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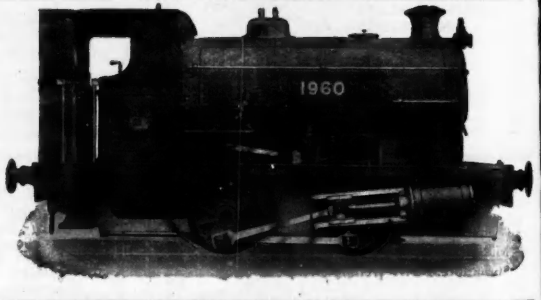

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